Background report of fishery products

The Maldives

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Background report of fishery products in The Maldives

1. Introduction

The Republic of Maldives is an archipelago of 26 natural atolls, consisting of 1190 coral reef islands in the Indian Ocean. The 1190 islands are grouped into 20 atolls for administrative purposes. The islands are scattered over an area of 750 km from north to south and 120 km from east to west covering around 90,000 sq km and about 99.5% of the country's territory consists of ocean (MPND, 2010). There are 200 islands which are inhabited, 89 islands used exclusively as tourist resorts and the rest are uninhabited and mostly used for industrial and agricultural purposes. The closest neighbours to the Maldives are India, Sri Lanka and the Laccadive Islands.

The island nation of the Maldives is blessed with abundant natural resources, which form the basis of the economic development of the country. Almost all of the natural resources are in the form of multicoloured coral reefs, tropical ocean fish of every colour and shape, crustaceans, turtles, seaweed and shells. The abundance of these natural resources forms the basis of the country's two most important economic activities - fisheries and tourism. Furthermore, similar to many of the Small Island Developing States (SIDS), the Maldives encounters various challenges and threats such as environmental disasters, international market shocks, communication and service delivery problems. These problems are part of the developing island nation's dilemmas that prevent progress and prosperity of the nations. In the past twenty years the Maldives has been able to increase its economic growth, from the two sectors, with a positive impact on the nation's wealth and social condition with the limited resources. The country has a few land based natural resources. The total land area suitable for agriculture (3000ha) is estimated to be less than 10 percent of the country's total land area (MPND, 2010). Even this cultivatable land area is unevenly distributed throughout the archipelago.

According to the latest figures, the total population of the Maldives is 324,992 of which around 34.68% live in the capital – Male. The annual population growth is estimated to be around 1.7%. The life expectancy of males and females is around 71 and 72 respectively (MPND, 2010). The country's literacy rate is around 98.94%, which is higher compared to neighbouring countries (MPND, 2010).

During the past two decades, Gross Domestic Product (GDP) growth averaged around 7.5 percent, raising per capita income to about US$ 2,800 per year (MPND, 2010). This is well within the middle class income level. Despite this tremendous and commendable growth in GDP, it is important to mention that the latest assessments prove that there is high concern of income inequalities and disparities among the population, especially among the rural communities and a significant percentage of people live in relative poverty[1](MPND, 2004b).

Historical facts attest to the fact that the Maldives has enjoyed a lucrative fisheries sector for centuries. The great Arab traveller Ibn Battuta, in his writings gave a clear account of the importance of the tuna fishing in the Maldives during his visits in 1343-44 and 1346 (Gray, 1889). There is also evidence that suggests fishing was an important activity in the Maldives before AH 548 (AD 1153-4) (Anderson and Hafiz, 1996) and consequently it can be deduced that the fisheries sector in the Maldives has been sustainably providing employment and trade in the Maldives for thousands of years. With the enormous development in the tourism sector, the focus of policy makers and investors has shifted away from the fisheries sector towards the tourism sector. This is especially visible in the central area of the country where tourism has started to play a major role in the livelihoods of the people. However, the importance of the fisheries sector in the livelihoods of the rural communities in other parts of the country has remained vital in terms of trade, employment and self-sustenance.

This paper aims to give background information of the Maldivian Fisheries for the value chain project of FAO and Norwegian Agency for Development Cooperation (NORAD). The paper reviews fisheries in the Maldives, the main species harvested and their export, the vessels used in the fishing operations and the data collection of the country.

2. Fisheries in the Maldives

The fishing industry is the second largest contributor of GDP after tourism in the Maldivian economy. In the past twenty five years the fishery industry contributed about 3% to 12% of the country's GDP. The fisheries sector was the major contributor to the country's economy until

[1]The index use five income classes based on the three poverty lines of 7.5, 10 and 15 rufiyaa per person per day, plus the international poverty line used for the Millennium Development Goals (MDGs) , Rf. 4.34, which is the rufiyaa equivalent of one dollar per person per day in terms of purchasing power parity.

1978. The industry's contribution to GDP has shown a continual declining trend since 1978. This was mainly due to the introduction and rapid growth of the tourism sector in the economy. However, it increased in the year 1986 (18%) and declined continuously until 2001. In addition, in 2006 there was an increase in the contribution of fishery sector to GDP (8%); this was mainly due to the increase in number of landings.

In the Maldives the fishery sector is important for creating employment, engaging about 20% of the total labour force (MPND, 2004a). In addition, fish is a staple food in the Maldives (with the exception of some poultry production) and it remains as the main source of protein for the population which comprises around 85% of total animal protein (FAO, 2003). The Maldives is one of the highest fish consuming countries in the world. Current estimates predict that 181kg of fish are consumed per capita per year.

The fishery sector also contributes to the country's export for instance, in the year 2010 it contributed around 96% of the country's total physical exports which was worth 74 million US$ (nominal value) (MOFA, 2010). The main trading partners are Europe, Asia and North America. On the other hand, the country's main tertiary sector (tourism) earned around 649 million US$ in 2007.

The fish catch in the Maldives has increased from 21,542MT in 1966 to 94,286MT in 2010(MOFA, 2010). However, the sector has suffered immense losses due to low harvest and the amount of catch dropped from 180,981MT in 2006 to 141,074MT in 2007- see figure 1. There are several hypotheses for the current low tuna catch. Following is a hypothesis regarding the skipjack tuna stock: *"The stock is probably not overfished, and overfishing is probably not occurring. However, the stock is probably near full utilization, and there is a possibility for skipjack to become overfished. Recent trends in certain fisheries suggest the situation of the stock should be closely monitored"*. The scientific advice for skipjack tuna was stated as: "*Skipjack tuna stock status is uncertain and should be closely monitored*".

On the other hand, there are serious concerns regarding the yellowfin tuna and bigeye tuna stocks in the Indian Ocean and the Scientific Committee of the Indian Ocean Tuna Commission issued the scientific advice for yellowfin tuna as: *"Yellowfin catches in the Indian Ocean should not increase beyond 300,000 t in order to bring the stock to biomass levels that could sustain catches at the MSY level in the long term. If recruitment continues to be lower than average, catches below 300,000 t would be needed to maintain stock levels"*

The scientific advice for bigeye tuna was stated as: *"Bigeye catches in the Indian Ocean should be kept at or lower than the 2009 level of 102,000 t"*

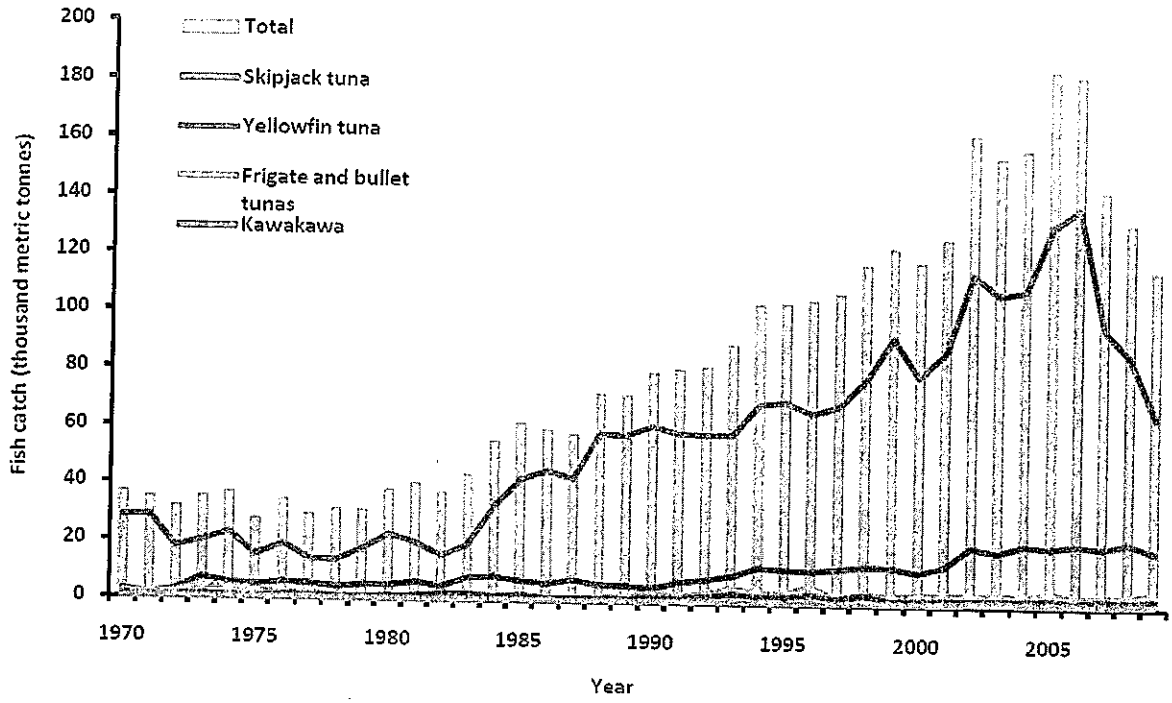

Figure 1: Fish landings in the Maldives from 1970 – 2010

Additional reasons for the low fish catch include first, the increase in sea surface temperature which affects the aggregation process resulting in a poor catch ability (Hilmy, 2008). Second, the increase in fuel prices and other commodities in the world market also influences the fish catch. The larger vessels tend to stay inland, in docks and ports with the slightest speculation concerning lower fish catch. With the increase in fishing cost, the vessel owners are reluctant to take the risk of fishing in fear of harvesting lower fish catch which will not cover their operational costs.

The harvesting sector's performance improved over the years and the main reason is accredited to the increase in effective power of fishing. This includes mechanisation of vessels, introduction of mechanical pumps for spraying water during pole-and-line fishing, more frequent use of radio communication between vessels, greater use of binoculars for spotting seabirds and an increase in the number of Fish Aggregating Devices (FADs) (Anderson and Hafiz, 1994).

Fisheries licensing scheme was also introduced in 2010 for commercial fishers under the regulation "Licensing regulation for fishing, processing and aquaculture intending for export".

Fishers intending to export fish or sell to an exporter are required to get licence under the regulation. The licence is renewed annually after paying a nominal fee.

In the Maldives there are no fisheries co-operatives and the fishers sell their catches to companies individually. Fishers in a fishing vessel get an equal share of the revenue after deducting costs and shares to fishing vessel owners. Skipper of the fishing vessel also gets a higher share compared to the fishers.

3. Types of Fisheries

The total fish catch in the Maldives in 2010 was around 95,000MT which comprises of skipjack tuna *(Katsuwonuspelamis)*, yellowfin tuna *(Thunnus albacores)* and a variety of reef fish. Skipjack tuna is among the most important species. In the recent few years, the yellowfin tuna *(Thunnus albacores)* has evolved dramatically and it contributes around 14% of the total catch (MOFA, 2010). This recorded catch also includes a small number of bigeye tuna *(Thunnusobsesus)*, frigate tuna or frigate mackerel *(Auxisthazard)* and dogtooth tuna *(Gymnosarda unicolor)*. The remaining portion of the fish catch is targeted on pelagic reef species.

3.1 Skipjack tuna *(Katsuwonuspelamis)* fishery

Skipjack tuna or '*Kalhubilamas*' as referred by the Maldivian language, is considered to be the most important species caught in the Maldivian tuna fishery and comprises around 70% of the total catch(Adam et.al 2007). Skipjack tuna fishery is primarily a live-bait; pole and line fishery and fishers usually go out for day trips.

3.1.1 Fishing Operation

In the Maldives the pole and line fishing vessels range from a length of three to five meters. Fishers' fish from the rear part of the vessel and around ten to twenty fishers fish simultaneously, standing on a platform running along the rear of the vessel. Tuna schools are located using either visual spotting (normally by seabird behaviour) or behaviour of the fish by using fish finders. Fishers also throw live-bait to attract fish schools. During fishing, fishers continuously chum live-bait and spray water to keep the school aggregated near the fishing vessel and several tonnes of tuna are caught in few hours.

Traditionally fish were arranged on the deck of the fishing vessels and were covered with bait nets to protect them from sun. In addition fishers occasionally sprayed water over the fish. However, with the arrival of larger fibreglass fishing vessels having freezing capacity, fish are being chilled as soon as the fishing operation is over.

The Government has initiated various programmes for the development of the fishery. The most significant developments are the mechanisation of fishing vessels and the introduction of the Fish Aggregating Devices (FAD), locally called *OlivaaliKandhufathi*. Experiments with FADs began in the Maldives in1981. The first attempt was an FAO-assisted experimental project (1981-82) to study the effectiveness and demonstrate the possible use of FADs. In 1985 – 1988 the United Nations Development Programme (UNDP) sponsored the installation of ten FADs, starting the very first trials; FADs have been a great success. With the mechanisation of the fishing fleet, the efficiency and range of operation of the fleet has increased. However, as tuna fishery in the Maldives is based on live-bait pole-and-line, fishers often spend long stretches of time searching surface-swimming schools of fish. FADs help not only to reduce searching time and fuel costs, but also increase production. Subsequent trials with various FAD designs have resulted in the development of a reliable FAD with an expected life of at least two years(Naeem and Latheefa, 1994). By September 2011, the Government of Maldives has deployed 50 FADs around the atoll rims of the country (MOFA, 2011).

Skipjack tuna are mostly caught in the Southern part of the Maldives namely from GA Atoll to Seenu Atoll as shown in figure 2. In the late 1980s, the central atolls were dominant in the skipjack tuna catches, but their share dropped significantly from early 2000s, mainly due to the huge investments made in the Southern atolls by fishers and skipjack tuna processing companies.

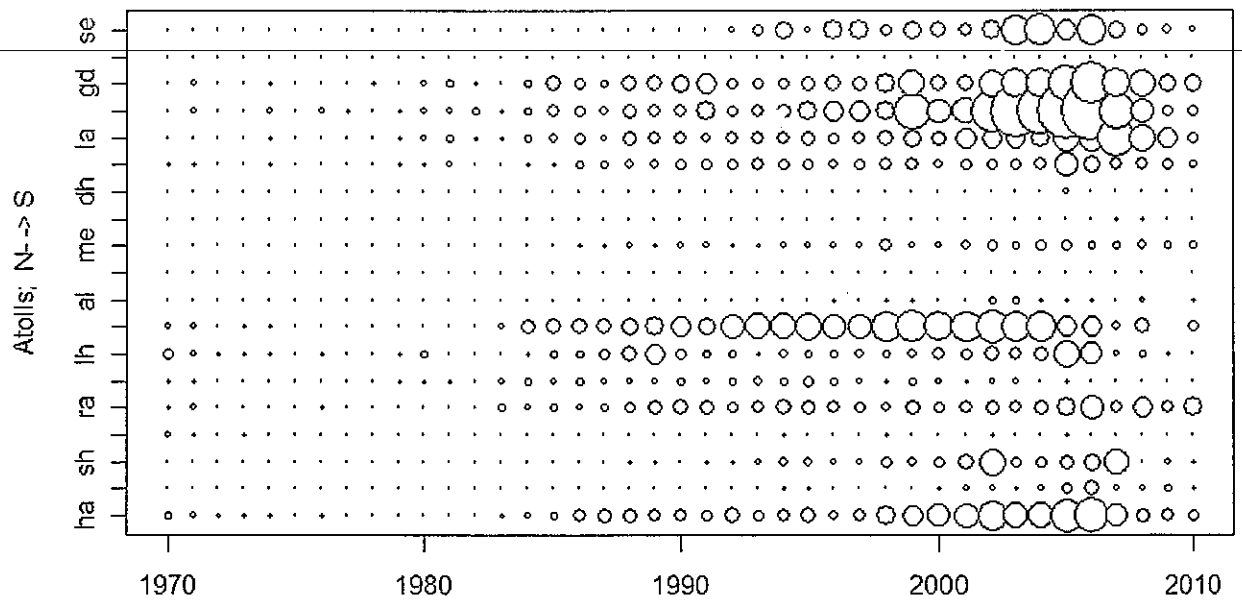

Figure 2: Skipjack tuna catches from 1970 - 1980 by Atolls from North to South

3.1.2 Live bait fishing

The tuna pole and line method requires copious amounts of live bait which are caught from lagoons and reefs. It is estimated that 80-150kg of bait are used per fishing trip (Anderson, 1994). The bait fish are caught daily by the fishing vessel prior to their fishing trip as there are no arrangements in the vessels to hold bait for longer durations. The main species caught in the bait fishery are Sprats (*Spratelloidesgracili, S.Delicatulus*) and various species of Casesionids, Apogonids, and Engraulidae (*Encrasicholinaheteroloba*) (Shiham Adam, 2006). However, the developments in the fishing industry changed the fishing technique of live-bait where people use high voltage lights to attract live-bait. Thus, using high voltage lights and larger fishing vessels made bait-catching operation easier and it also increased the fish catch per vessel.

3.1.3 Skipjack Tuna Post Harvesting Sector

Before 1970s there were not many forms of fish processing in the Maldives. Basically there were two types of end products namely traditional smoked and dried tuna (*Maldive Fish*), and salted dried fish. When Sri Lanka cut back its imports of Maldivian fish products in 1970, the Government of Maldives was forced to find an alternative mechanism to obtain foreign currency.

As a result Japanese Marubeni cooperation became the first foreign company to purchase the country's fish. In the early 1970s local catch increased considerably due to the mechanisation of fishing vessels. As a result of the increased local catch, there was a greater need for product diversification and enhanced value added products, resulting in the establishment of a joint venture canning plant in the island of Felivaru in 1978. However, due to price fluctuation in international markets in early 1980's, the Japanese company ceased its operation in Maldives. Thus, the government of Maldives purchased the facilities and upgraded it to continue the canning and freezing operation in Felivaru. The Government owned company, Maldives Industrial Fisheries Company (MIFCO) had deployed several collector vessels throughout the country to buy and transport fish from fishers to company owned cannery and cold storage.

Fishers had almost a fixed price for their catch for decades, since a single government company has a monopoly power in the post-harvest sector. The government owned MIFCO had a social responsibility of buying fish from fishers, for instance it was obliged to buy fish from fishers when the world tuna market collapsed in 2000.

The harvesting sector invested heavily on larger fibre glass vessels with increased capacity of engines due to the increase in catch. However, despite the rapid development of harvesting sector, the post harvest sector was lagging behind. The main reason behind the lack of investments in the sector could be the monopolistic power MIFCO enjoyed (Sinan and Whitmarsh, 2010). The Government of Maldives was forced to privatise the skipjack tuna post harvesting sector in 2003 mainly due to the inability of MIFCO to buy catch from the fishers. Nonetheless, MIFCO has continued to wield its monopolistic power over the sector due to the bias created in the privatisation process. Thus, it has been cited as one of the reasons for the slow growth in the post harvest sector as the private post harvest companies refuse to invest further, leading to a mismatch between the harvesting and the processing sector (Solah, 2007). Currently there is only one company, out of the four private companies given licenses, in operation.

Skipjack tuna is mainly caught from the South of the Maldives and the Horizon Fisheries Private limited is the sole company operating in the South of the Maldives. The remaining three companies seized their operations due to the decrease in fish landings starting 2006. Thus, the State owned MIFCO and Horizon Fisheries Pvt Ltd specialize in exporting skipjack tuna, juvenile yellowfin tuna and bigeye tuna.

Despite the arrival of the four new private companies in the harvesting sector, fishers were offered steady price which does not reflect the high market price the buyers enjoy. In order to protect the livelihoods of the fishers from the competitive post harvesting companies, the government has also enforced a minimum base price under section 12 of the 'Skipjack Purchase and Export Regulation 2001'. Even though the processing companies have never sold at a price close to the base price, the government has resisted in abolishing the base price (Sinan and Whitmarsh, 2010).

In December 2010 the Government introduced a scheme for Small and Medium Enterprises (SME's) to purchase skipjack tuna. The main aim of the SME's is to increase value added products and to create a competitive environment for fishers to benefit from the competitive prices. There is no restriction for the number of SMEs entering the sector.

In the development of the Skipjack tuna, one of the biggest hurdles for the Government of Maldives is the seasonality of the fish catches. Tuna catches increases from September till April and drops significantly from May till August. Companies face an uphill task to operate with the low catches from May till August as the operational costs increases, and some of the companies seize some of their processing capacity during the low fishing months.

The average price of skipjack tuna per kg differs among the two companies operating in the post harvest sector. Thus, starting January 2006 until December 2010 the price figures of MIFCO and Horizon were MRF 5.67 and MRF 6.83 respectively-see figure 3. However, the prices during the last quarter of 2010 increased to around MRF10.87 per kg.

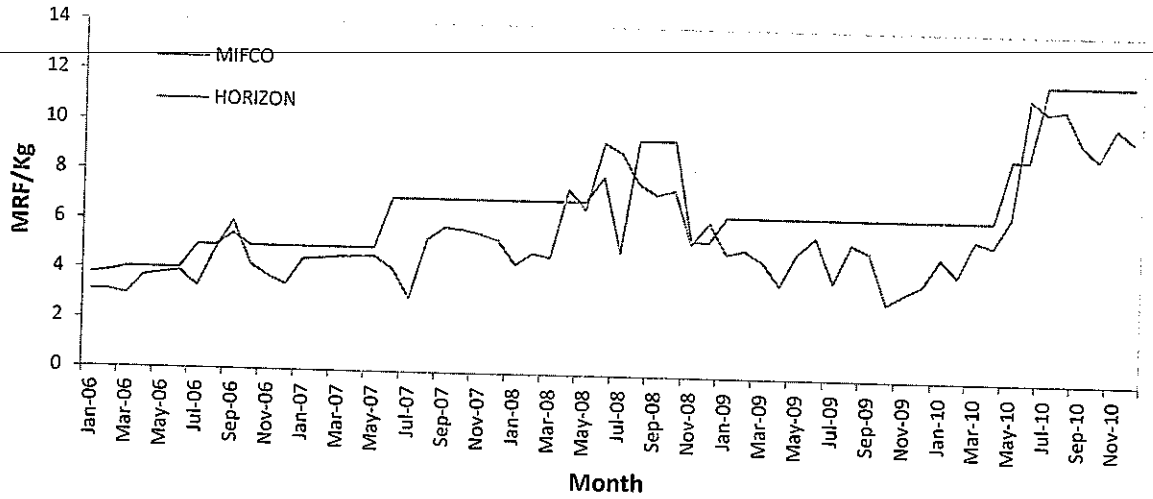

Figure 3: Price of skipjack tuna by the two main fish companies, January 2006 - October 2010

3.1.4 Markets

Skipjack tuna is among the most important Maldivian diets hence around 20-30% of the total catch is consumed by locals and tourists whereas the rest of the catch is exported (MOFA, 2006). Skipjack tuna is exported either as frozen, fresh, chilled or canned by the companies which are authorised to purchase fish from fishers exceeding 2MT per month- refer to table 1. In addition, there is a significant portion of dried or smoked fish (commonly known as *'Maldive Fish')* mainly exported to Sri Lanka by the cottage industry[2]- see table 1. The cottage industry is able to offer higher prices to the fishers due to their low operational costs and it created enormous competition with the processing sector, especially in the low season. However, it is highly beneficial to the fishers as they can sell and bargain for higher prices in the market.

Table 1: Export of skipjack tuna products by quantity and value (MRF) in 2010

Description of the Product	Quantity (Kg)	Value (MRF)	Price per kg (MRF/kg)
Frozen Skipjack Or Stripe-Bellied Bonito	16,352,427.70	235,959,209.05	14.43
Dried Skipjack (Maldive Fish)	3,807,397.10	143,172,548.01	37.60
Salted Dried Skipjack	1,621,606.95	15,891,815.47	9.80
Prepared, Preserved Skipjack	688,013.78	36,528,655.51	53.09
Fish Chips (Skipjack , Tuna) Dried	44,692.00	1,038,371.70	23.23
Fresh Or Chilled Skipjack Loins	134.75	5,066.61	37.60
Fresh Or Chilled Skipjack Or Stripe-Bellied Bonito	10.04	232.20	23.13

[2] Cottage Industry – small scale processors who process fish in their households and sell through middlemen. The main products from these processors are dried fish and salted dried fish.

The Maldives exports different products of skipjack to countries like Thailand, Sri Lanka, Iran, UK, Tunisia, Japan and Germany –see figure 4. Thailand is the main export market for frozen and fresh skipjack whereas canned skipjack is exported to Germany and UK (MOFA, 2010). In the year 2010 the Maldives exported around 59% of its total skipjack export to Thailand- see figure 4. Sri Lanka is the second biggest skipjack tuna export market for the Maldives, following Thailand. Dried Fish and Salted Dried Fish are the main exports to Sri Lanka. In addition, the skipjack tuna exports to the Iranian market expanded in 2010 and it is a potential market for frozen skipjack tuna as it offers a better price compared to the Thailand market.

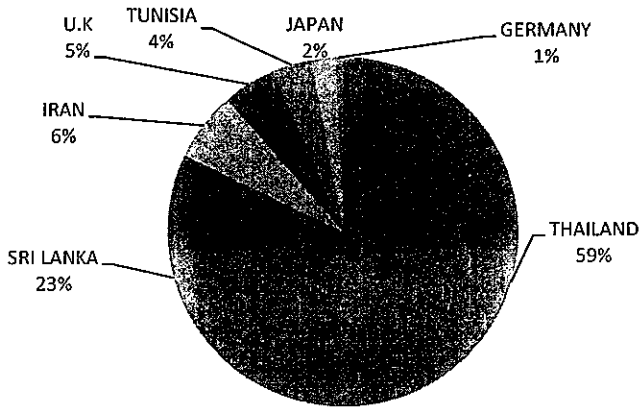

Figure 4: Percentage share of skipjack tuna export to countries by weight in 2010

3.2 Yellowfin tuna (Thunnus albacores) fishery

Yellowfin tuna (*Thunnus albacores*) or '*Reedhoo Uraha Kanneli*' as referred in the Maldivian language, is the second most important fish species in the Maldives, it comprises around 17% of the total national catch. In the past, there was no targeted yellowfin tuna fishery since there was no demand. However, the increase in the access of overseas fresh fish markets increased the demand for large yellowfin tuna which in return made it possible to establish handline tuna fishery. Although a large amount of juvenile yellowfin tuna was continuously caught by pole and line fishery, major portion of large yellowfin tuna (more than 100 cm FL) are also caught from hand line fishery.

The Maldivian Yellowfin tuna fishery is essentially a live-bait pole and line fishery. The catches by traditional pole and line vessels account over 95% of the total Yellowfin tuna catch (MOFA, 2010). Yellowfin tuna caught in the Maldives are mainly surface swimming juveniles within the size range of 30-60cm. Hand lining and trolling are also used to catch large size, more than 70cm, Yellowfin tuna. In addition, longliners operating in the waters of the Maldives Exclusive Economic Zone (EEZ) harvest deep swimming adult tuna as well (Adam and Anderson, 1995). Yellowfin tuna are mostly caught by fishers from the central atolls of the Maldives as shown in figure 5. The atolls dominant for skipjack tuna fisheries are not involved with the yellowfin tuna fishery.

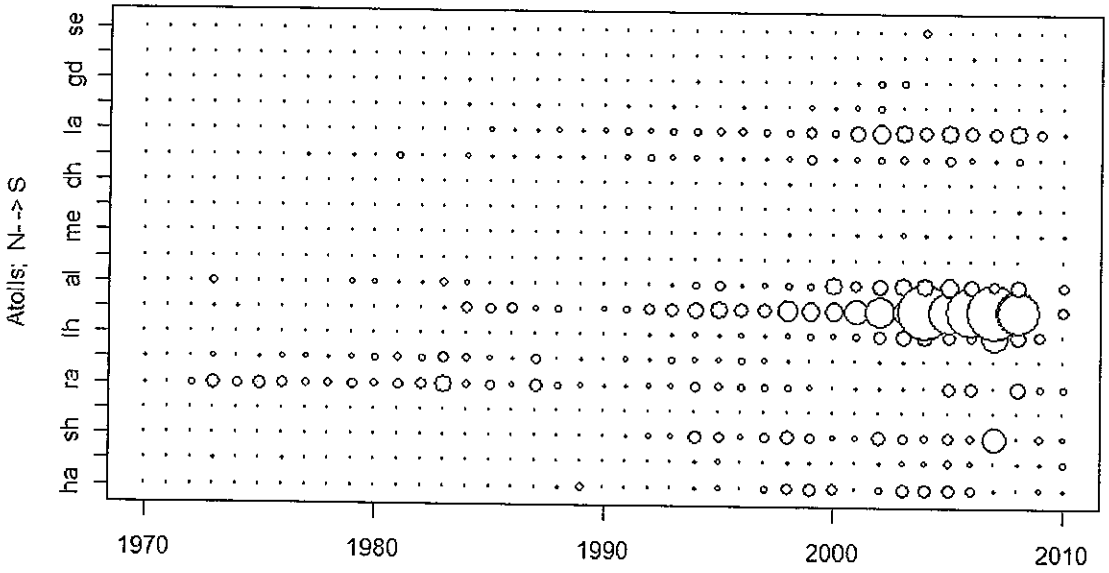

Figure 5: Yellowfin tuna catches in the Maldives from 1970 - 2010 by atolls from North to South

The Maldives 'yellowfin tuna' catch records include a small number of bigeye tuna. This is mainly due to the use of handlines while fishing yellowfin and the gear is not set deep enough for bigeye tuna. Although, there are no separate statistics available for bigeye tuna*(Thunnusobsesus)*, preliminarily studies suggest that it may account up to 5% of the total yellowfin catch (Anderson and Hafiz, 1991).

3.2.1 Fishing method

Large yellowfin fishing is carried out on regular pole-and-line vessels without any modification except the use of handline gear. However, the vessels carry locally fabricated FRP ice-boxes with capacities of either 5 or 10MT and the boxes are placed at the back of the vessel on the

fishing platform. Several fishers have made informal arrangements with the yellowfin exporters to get supplies of ice-boxes and ice. Often ice-boxes and ice are provided free of charge when the fishers agree to sell their catch to that particular exporter. In the Maldives there are few processors with ice plants and these plants have monopolistic power. As a result if fishers refuse to sell their catch to these plants, the plants in return will refuse or delay the ice trading.

A variety of live bait is used to catch large yellowfin which includes trigger fish, and bigeyescad. Yellowfin tuna fishing trips may last between one to two weeks. An average of 2-3 tons of yellowfin is caught per fishing trip where more than 95% of the catch is exported and the rest is consumed in the domestic fish markets. Fishers start their fishing trip by catching enough live bait for a week or more and they keep them alive in live bait wells or bait vessel. Most of the yellowfin tuna are caught in dolphin associated fish schools. When the dolphin school is sighted, they start chumming live baits to attract the fish along with the board of the vessel. Fishers cast their line with live bait attached to the hook and often 5-6 lines casted at the same time. Normally hand lines are very long (about 500m) and these long lines are used to weaken the fish while in the sea, which makes it easier to bring the fish back to the vessel. As soon as the fish is hauled to the deck, it is gutted and gilled before storing in the ice box. During this activity live baits are thrown continuously to keep the school aggregated around the vessels.

The Government of Maldives stopped issuing or renewing licenses for foreign vessels starting March 2009. It was mainly due to lack of compliancy regarding illegal fishing in the Maldivian water. The longliners which operated before 2009 were mainly from Indonesia and Taiwan and their main catch were deep swimming adult yellowfin tuna and bigeye tuna. These longline vessels use to pay royalty for their catches, and they were restricted to fish outside 75 miles. In December 2010, the Government announced its plan to develop a local longline fishing fleet to catch deep swimming adult yellowfin and bigeye tuna. Although the longline fishing operations have not started yet, MOFA has issued longline fishing permit for three local vessels and other vessels (which were imported from Indonesia, Sri Lanka and Iran) are in the process of localization. The Government of Maldives has submitted a fleet development plan which includes the plan to develop a longline fishery in the Maldives. According to this plan Maldives will allow 30 longliners to operate between 100 to 200 nautical miles within Maldives EEZ in 2012. In addition, in the next ten years around three new entries will be allowed.

3.2.2 Yellowfin tuna post harvesting sector

The increase in the price and demand of Yellowfin tuna, in the European and Japanese Sashimi markets, led to a shift from Skipjack tuna to Yellowfin tuna industry. In addition, fishers tend to shift between the two species based on the fishing season since both species use similar harvesting techniques. The major portion of the yellowfin tuna caught in the Maldives is exported, while the rest is consumed locally mainly by hotels and restaurants. Under the "*yellowfin tuna fishing and exporters regulation*", companies exporting yellowfin tuna had an agreement with the fishers where the fishers were forced to sell to a particular exporter until 2009. This allowed the export companies to dictate the prices whereas the fishers were getting lower price. The Government revised the above stated regulation and removed the clause in 2009. This allowed the industry to be competitive where there was no restriction for new fish processors entering the market and it also allowed fishers to sell to any processor. However, some of the fish processors provide incentives, such as ice and fuel, to fishers. In addition, some of the processors also have contracts with fishing vessels which force them to sell to specific processors. The prices of the yellowfin tuna heavily fluctuates depending on the European market prices. The processing companies base their processing activity depending on the volume of fish ordered from the European market. The average yellowfin tuna price from January 2007-October2011 is shown in figure 6. The average price of yellowfin tuna fluctuated over the years and the average price in 2011 is around MRF 60 per kg.

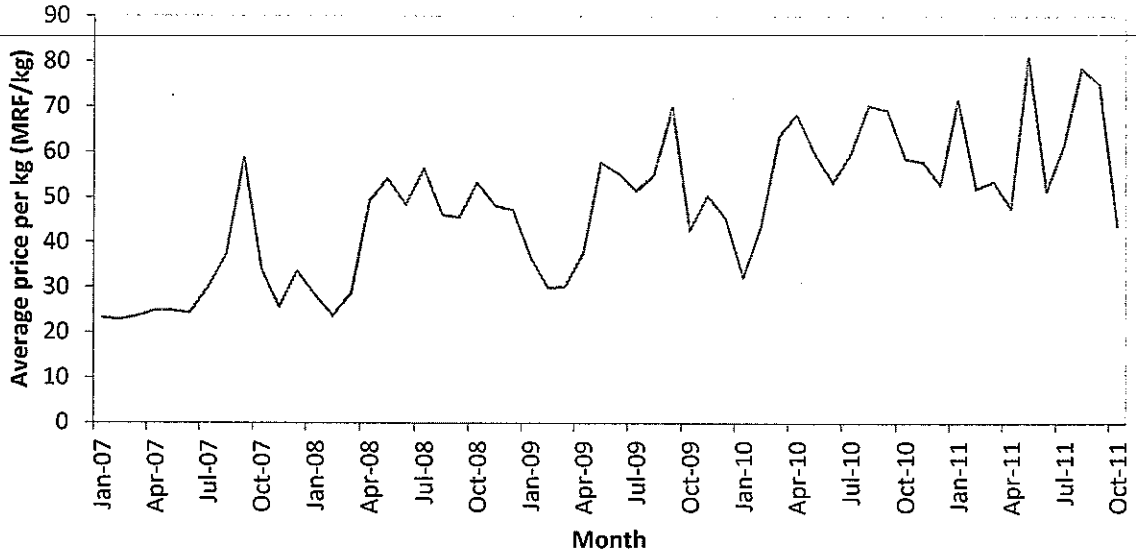

Figure 6: Average yellowfin tuna prices in The Maldives

Yellowfin tuna is exported to different countries such as Thailand, France, Italy, UK, Tunisia, Germany, Iran, Spain, Sri Lanka, Switzerland, USA and The Netherlands –see figure 7. The highest export revenue in 2010 was earned from Thailand (60%) followed by France(12%) and Italy(9%). Fresh and chilled yellowfin tuna products are mainly exported to France and Italy. Whereas, canned tuna is preferred in UK and Germany. In addition, frozen loins, steak, fresh and chilled yellowfin tuna are exported to Europe and United States.

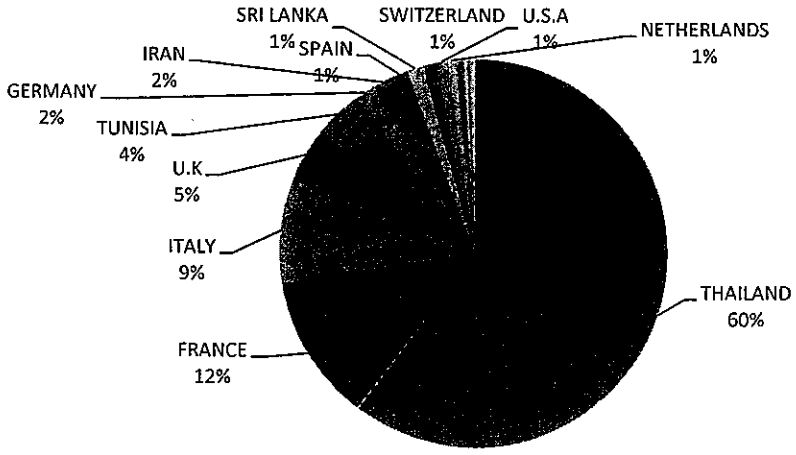

Figure 7: Percentage share of yellowfin tuna export to countries by export value in 2010

3.3 Reef Fishery

In the Maldives the term 'reef fishery resources' refers to all fisheries except tuna fisheries. These are reported as one category in the national statistics and the reef fisheries component in the statistics includes reef and oceanic shark, jack, scads, bream, jobfish, sail fish, seer-fish, rainbow runners and dolphin fish *(mahimahi)*(Adam, 2006).

The reef fishery resources were hardly exploited until the late 1990s (Adam et al., 1997). However, with the increase in socio-economic benefits from the tourism sector together with the improved air and sea transportation, reef fisheries have developed significantly for export[3] and local consumption. These include the aquarium fishery, sea cucumber (*beche-de-mer*) and groupers. The increase in prices of reef fish in the international market has also boosted local investment for the exploitation of reef fish. These investments have also contributed to the tuna industry mainly as an alternative species during the low season (Shakeel and Ahmed, 1996). The reef fishery reached its peak in 1997, when around 0.9 million groupers were exported. However, since 1997 the figures decline continuously (Anderson et al., 1992). Nowadays, the reef associated demersal species are heavily exploited, mainly by tourists, recreational anglers and industrial fishers targeting for the export market.

3.3.1 Bait collection

In reef fishery the type of bait depends on the target species. Most common types of baits are fresh fish Kawakawa, bigeyescad, and jack mackerel. In reef fishery, fishers catch bait and keep them alive to target Travelly (Handhi). Fishers often have specific locations for catching baits and when the vessel reached the specific location, fishers use fish flesh scrapings (filijehun) to attract the bait. Fish species most commonly used for this purpose are kawakawa and they are caught by trolling on the way to the bait haul location. Bait fish are either caught with hand line or bait nets, whereas in some cases small poles are used to catch bait species such as bigeyescad.

3.3.2 Fishing methods

Reef fishing is done through different gears, depending on the targeted species. The main gear used in reef fishing is a simple, single hook hand line. Live-bait hand lining is also used occasionally when targeting jack and large snapper (Anderson et al., 1992).

[3] Exportation of reef fish began in 1994 mainly targeting grouper products and then followed by aquarium fish and sea cucumber.

3.3.3 Post-harvest sector

Reef fish is locally consumed when tuna harvest is low and the majority of reef fish is consumed by tourists. It is estimated that tourist resorts purchase 167 kg of fish per night to feed their guests and staff and 38% of which was estimated to be reef fish (snapper, emperor and grouper) (Van Der Knaap et al., 1991). The Maldives main export markets are Taiwan, Sri Lanka and Hong Kong. Taiwan earns the highest reef export revenue (48%) followed by Sri Lanka and Hong Kong.

The Maldives generates the highest income by exporting Marlin; for instance in 2010, 3.76 million rufiyaa was earned by exporting Marlin (MOFA, 2010).

3.4 Grouper Fishery

A separate grouper fishery, especially targeted for the export industry was also initiated in 1993 in Vaavu atoll (Sattar and Adam, 2005). In about two years time the fishery spread throughout the Maldives and reached its peak, exporting 1000 tons in 1995 (Shakeel and Ahmed, 1996). At that time grouper exports alone contributed about 10 percent of the total income from marine exports. Due to the sudden exploitation of groupers, there was a huge impact on the grouper stock. At present grouper fishing is mainly carried out by fishers of Baa atoll, Vaavu atoll, and Faafu (Sattar et al., 2011) in various parts of Maldives. Groupers have a very high market value in Southeast Asia mainly in China, Hong Kong and Taiwan.

Unlike the past years, buyers now do not always relocate collection facilities where fishing is good. Instead, fishers conduct weekly trips and sell to the main collection cages bi-weekly. Fishers sell to the collection cages which offer the best deal and guarantees cash.

3.4.1 Fishing method

Grouper fishing is carried out mainly through visual-aided snorkelling, whereby fishers enter the water with the baited drop lines and a collection basket. Once a grouper is sighted, the baited line is dangled in front of the individual to catch it. In such instances all fishers except one would be dropped off at different points of the reef, while one stays on board in sight of all fishers in the water. Fishers spend around 8-10 hours/day in the water and they take a break every two hours. Some fishers still carry out the fishery in small *mas-dhoanis* (from the vessel) using baited drop lines. The gears used in both cases are lines with normal hook and sinkers. Hooks are baited with

live bait or cut piece of tuna. Sometimes groupers are caught from as deep as 80 m and the rapid ascend from such depths sometimes inflate their bladder. These fish are degassed properly in order to keep them alive. Fishers are now experienced in catching these deeper dwelling groupers and have learned methods which decrease the effects of being hauled from such depths.

3.4.2 Post harvesting Sector

The export-based grouper fishery started in 1994 mostly in the central atolls, but it later spread to the whole country. As can be referred in figure 8, there was a dramatic increase in the quantity of groupers exported from 1994 to 1995. One of the most important points to be referred in figure 8 is the trend shown in the export of live groupers. Live export reached a peak of over 400,000 annually between 1995 and 1997, but by 2004 it declined to a quarter of this number. However, live exports have been on an increasing trend since 2007 though the rate of increase was very slow compared to that of fresh/chilled exports. The recent increasing trend in live exports could be attributed to a number of factors, one of which is the ability to export live groupers via air freight in oxygenated fish bins.

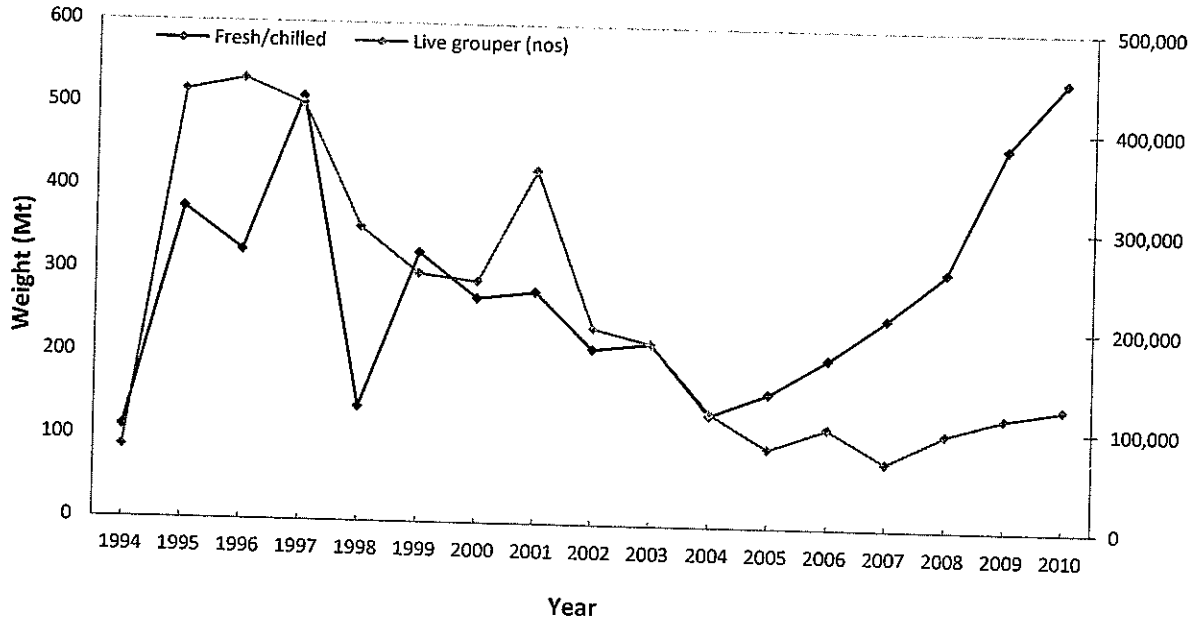

Figure 8: Exported quantity of fresh/chilled and live groupers from 1994 – 2010

Source: (Sattar et al., 2011)

Groupers are exported mainly to Taiwan and Hong Kong as shown in figure 9. However, some of the products are exported to Thailand, Greece, Malaysia, Singapore, USA and Spain. Groupers are exported in the form of fresh, chilled, live and to a small extent frozen form. Live groupers are exported mainly to Hong Kong (99%) whereas; fresh and chilled groupers are exported to Taiwan (96%).

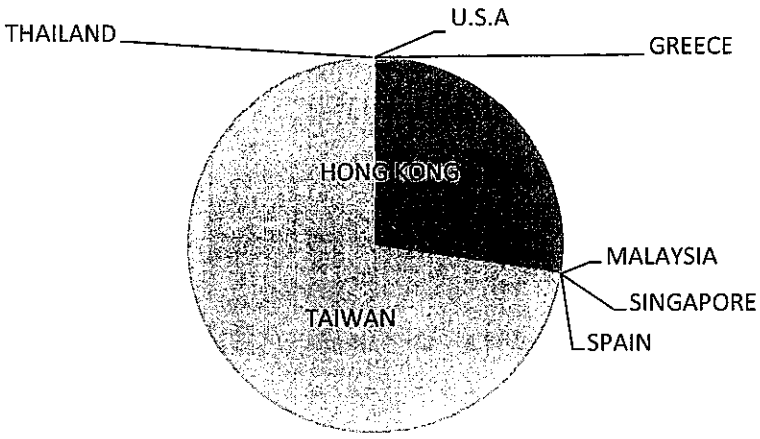

Figure 9: Percentage of grouper export to different countries in 2010

3.5 Shark Fishery

Maldives had a minor shark fishery for centuries (Anderson and Ahmed, 1993). Traditionally, all Maldivian fishing boats (*dhoani*) were made of wood and require regular hauling up on the beach to be cleaned and painted with oil, and shark livers were the main source of this oil. To supply this oil demand, there was a traditional shark fishery known as *maakeyolhukan* (literally, big line fishing) (Anderson and Ahmed, 1993). This shark fishing targeted big sharks and large tiger sharks were the main catch, although whale sharks and bluntnose sixgill sharks were also taken. This fishery vanished in 1960s with the introduction of modern longlining. The impetus for that change was the entry of Japanese tuna longliners into the central Indian Ocean, as well as the opening of a boatyard on Hulhulé island (Saleem, 1987). Shark longlining started to spread through Maldives, replacing the traditional tiger shark fishery (usurping the name *maakeyolhukan*).

In the shark industry widespread motorization of fishing vessels began in the 1970s and gillnet was also introduced to The Maldives around the same time. In the mid 1970s, trade developments led to the opening of wider market opportunities for shark products, and higher prices for exports (Anderson and Ahmed, 1993). This in turn encouraged product diversification and the shark fishery shifted from producing shark liver oil for domestic consumption with some minor trade in shark fins, to the one in which the main product was shark fins for export. In addition, there is also export of salted dried shark meat and high-value shark liver oil plus continued consumption of low-value shark liver oil. The demand for high-value squalene-rich shark liver oil greatly increased in the 1980s, when Japanese buyers visited the Maldives looking for supplies. A small multi-hook handline (vertical longline) fishery soon developed for the deepwater gulper shark (*Centrophorus* spp.) to meet this demand. Thus by the end of the 1980s, there were three main shark fisheries namely oceanic sharks, reef sharks, and deepwater gulper sharks (Anderson and Ahmed, 1993). Table 2 indicates the different shark species caught in the Maldivian waters and the level of catch for each fishery type.

Table 2: Shark species caught in the Maldivian water and the level of catch by fishery type
Sources: Anderson and Ahmed, 1993, Anderson and Waheed, 1999

English Name	Scientific Name	Maldivian Name	Fishery Type		
			Deep	Reef	Ocean
Bluntnose sixgill shark	*Hexanchus griseus*	Madu mayaru	**		
Taiwan gulper shark	*Centrophorus niaukang*	Kashimiyaru	***		
Leafscale gulper shark	*Centrophorus squamosus*	Kashimiyaru	***		
Mosaic gulper shark	*Centrophorus tessellatus*	Kashimiyaru	***		
Zebra shark	*Stegostoma fasciatum*	Hitha miyaru		*	
Tawny nurse shark	*Nebrius ferrugineus*	Nidhan miyaru		*	
Whale shark	*Rhincodon typus*	Fehurihi		P	P
Smalltooth sand tiger	*Odontaspis ferox*	Daiydhigu miyaru	*	*	
Crocodile shark	*Pseudocarcharias kamoharai*	Miyaru			*
Pelagic thresher shark	*Alopias pelagicus*	Kandi miyaru			*
Bigeye thresher shark	*Alopias superciliosus*	Kandi miyaru			*
Thresher shark?	*Alopias vulpinus*	Kandi miyaru			*
Shortfinmako shark	*Isurus oxyrinchus*	Woshimas miyaru			*
Longfinmako shark	*Isurus paucus*	Woshimas miyaru			*
False catshark	*Pseudotriakis microdon*	Hikandhithun miyaru	*		

Silvertip shark	*Carcharhinus albimarginatus*	Kattafulhi miyaru	**	*
Bignose shark	*Carcharhinus altimus*	Mendhan miyaru		**
Grey reef shark	*Carcharhinus amblyrhynchos*	Thila miyaru	**	
Silky shark	*Carcharhinus falciformis*	Ainu miyaru		***
Blacktip shark	*Carcharhinus limbatus*	Miyaru	*	
Oceanic whitetip shark	*Carcharhinus longimanus*	Feekanfaiy miyaru		**
Blacktip reef shark	*Carcharhinus melanopterus*	Falhumathi dhon miyaru	**	
Spottail shark	*Carcharhinus sorrah*	Dhon miyaru	*	
Tiger shark	*Galeocerdo cuvier*	Femunu	*	*
Sicklefin lemon shark	*Negaprion acutidens*	Olhufathi miyaru	*	
Blue shark	*Prionace glauca*	Andhun miyaru		*
Whitetip reef shark	*Triaenodon obesus*	Faana miyaru	**	
Scalloped hammerhead	*Sphyrna leweni*	Kaaligandu miyaru	*	*
Smooth hammerhead	*Sphyrna zygaena*	Kaaligandu miyaru		*

*Key: *** major target species, ** regularly taken, *occasionally taken,* P = *protected species under Environment Law.*

Shark fins are obtained from both reef sharks and oceanic sharks, and the two types are not differentiated in the export statistics of the country- see figure 10. In the 1960s and early 1970s, the Maldivian shark catches was low however, an expansion of shark fishing effort was made (particularly on reef sharks) since 1976-77 (Anderson and Ahmed, 1993)-refer to figure 10. Thus, in 1977-2006 the average estimated reef and oceanic shark catch was around 1440 tone/year. In the late 1970s and 1980s reef shark was probably the dominant catch however, reef shark was overfished and in the 1990's oceanic shark dominated the industry. Since the peak in 2004, estimated catches of shark have declined dramatically-see figure 10. This is mainly due to the overexploitation and partly due to withdrawal of fishers from the shark fisheries for a variety of socio-economic factors. In addition to concerns about over-exploitation of shark stocks, two conflicts of interest have driven shark fisheries management in recent decades.

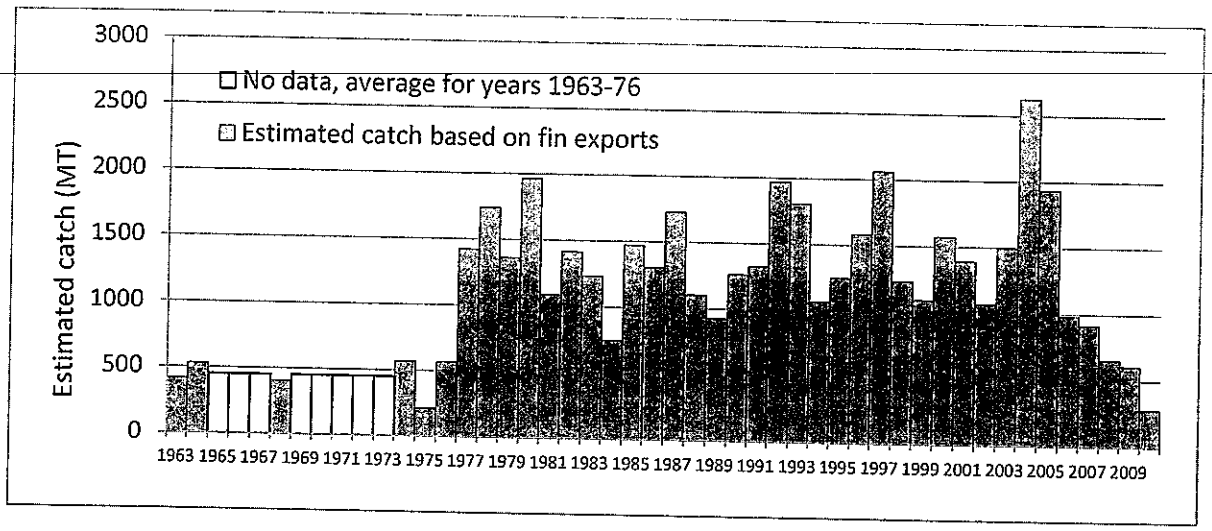

Figure 10: Estimated annual catches of reef and oceanic shark species combined, 1963-2010, calculated from fin export data.

Sources: Anderson and Ahmed (1993), Anderson and Waheed (1999), MRC (2009), Customs data compiled by MOFA.

One conflict of interest was between reef shark fishers and the tourism industry. Sharks in the Maldives do not have exaggerated man-eating reputation like in some other countries. As a result reef shark watching by divers is one of the main attractions for tourists. It was estimated in 1992 that divers spent around US$2.3 million to watch the sharks in the Maldives; in contrast the export of all shark products earned around US$0.7 million in the same year (Anderson and Ahmed, 1993). Tourism is vital to the Maldivian economy, and it has been the largest sector of the economy for over two decades. Tourism is heavily dependent on the attractiveness of the marine environment, where one survey in the early 1990s estimated the contribution of the marine environment to over 70% of tourists' enjoyment during their stay (MOT, 1994). The study also indicated around 38% of tourists went snorkelling, while around 18% were diving (MOT, 1994).The recognition of the economic importance of reef shark watching was of key importance in the introduction of increasingly wide-ranging restrictions of reef shark fishing, leading up to the complete ban in all shark fishing in 2010.

The second major conflict of interest was between oceanic shark and tuna fishers. Maldivian fishers have traditionally targeted surface-swimming skipjack and yellowfin tuna, using pole and line. The fishers are well aware of the close relation between these tuna schools and sharks, especially silky sharks (Anderson and Ahmed, 1993). Most fishers believe that the harvesting of

silky sharks and other sharks associated with tuna schools have a huge negative impact on tuna availability. Pressure from the large tuna fishing industry led to restrictions on shark fishing in the vicinity of tuna schools, and around seamounts and FADS where tuna aggregate.

The Ministry of Fisheries and Agriculture introduced various shark fishery management measures since 1981- see table 3. None of these, however, was entirely successful in halting the decline in shark abundance, or the conflicts of interest between different users of the resource. It gradually became clear that nothing short of complete bans on shark fishing and on shark product exports would be effective. After due consideration mostly based on the contribution of shark fishery and tourism to the economy, the Fisheries Advisory Board (FAB) banned the harvest of any shark species within 12 mile radius from the rim of the Atolls in the Maldives effective from March 1, 2009. This decision was further discussed in the cabinet and on March 11, 2010, the Ministry of Fisheries and Agriculture announced a ban on any fishery targeted at killing, capturing or extraction of shark species within the Maldivian waters. The ban was made practical since March 15, 2010 (Sinan et al., 2011)- refer to table 3 for detailed time line development in the shark fishery.

Table 3:Time-line of developments in shark fisheries and management (Sinan et al., 2011)

Year	Development in the shark fishery and management
1960s	Introduction of longlining, which was soon adapted for sharks
Mid-1970s	Rapid expansion of shark fisheries in Maldives
1980	Start of deep-water gulper shark fishery
10 Nov 1981	Shark fishing prohibited during daytime in tuna fishing areas (Ministry of Fisheries Iu'laan 48/81/34/MF)
1982-84	Peak of deep-water gulper shark fishery
Late 1980s	Collapse of deep-water gulper shark fishery
19 May 1992	Shark fishing with livebait prohibited in vicinity of tuna schools while other vessels are present and fishing for tunas (Ministry of Fisheries and Agriculture Iu'laan 16/92/29FA.A1). This replaced the Iu'laan of 10 Nov 1981.
1992-93	First review of shark fisheries; first valuation of reef shark diving tourism
5 June 1995	Declaration of first Marine Protected Areas (15 dive sites, nine of which were well-known for their reef sharks) (Ministry of Planning, Human Resources and Environment Iu'laan E/95/32)
24 June 1995	Ban on fishing for whale sharks (MOFA Iu'laan FA-A1/29/95/39)
8 Oct 1996	Ban on taking sharks or any type of fishing the might be detrimental to pole and line tuna fishing within 3 miles radius of any FAD (MOFA Iu'laan FA-A1/29/96/39)

28 Nov 1996	Longlining banned in vicinity of seamount between Hadhdhunmathi and Huvadhoo Atolls (MOFA Iu'laan FA-A1/29/96/43)
10 Dec 1997	Longlining banned in vicinity of seamount south of Addu Atoll (MOFA Iu'laan FA-A1/29/96/54)
8 Sept 1998	10-year moratorium on shark fishing within 12 nautical miles of seven (tourism zone) atolls (MOFA Iu'laan FA-A1/29/98/39)
1 March 2009	Ban on shark fishing within 12 nautical miles of any atoll (MOFA Iu'laan FA-D/29/2009/20)
11 March 2010	Ban on shark fishing throughout Maldives from 15th March 2010 (MOFA Iu'laan 30-D2/29/2010/32)
21 July 2011	Ban on capture, keeping, trade or harming sharks (Ministry of Housing and Environment Iu'laan138/1/2011/42)

The management decision taken on 15 March 2010 to ban shark fishing in the Maldives had a significant impact on the livelihoods of shark fishers. Since the shark fishery in the Maldives is seasonal, most of the fishers already had an alternative livelihood for the low shark fishing period. Hence, the Government initiated a MRF 7 million fund to buy back the gears used by the shark fishers. Apart from these, priority is also given to former shark fishers in the soft loan schemes initiated by the government. A training program on longline fishing targeting large yellowfin tuna is also planned for former shark fishers at the end of this year (Sinan et al., 2011).

3.6 Mariculture

Capture fisheries have always been the mainstay of the country's economy. The idea of developing marine mariculture industry has been introduced recently to diversify the country's fisheries sector and currently a few mariculture pilot projects are carried out in the Maldives. Under UNDP funded project, Marine Research Center has been conducting demonstration project for pearl culture.

A private company has started culturing sea cucumbers in hatcheries and has been growing them in mangrove areas and lagoons in some of the islands. The Government of Maldives has announced a scheme to fund aquaculture projects in December 10, 2010.

3.6.1 Fishing vessels

There are three major types of fishing vessels used in Maldives and they can be classified into *mas-dhoani*, *vadhu-dhoani* and *bokkuraa*.

3.6.1.1 Mas-dhoani

Mas-dhoanis are open boats with deep bilge, which helps for smooth sailing and serves as live-bait wells. The baits are kept alive in the bait well and in order to provide circulation of fresh seawater there are a number of holes at the bottom of the vessel and a pump regularly controls the water level. The stern is fitted with a small platform, which extends outward on both sides of the vessel. The skipper and the rest of the crew stand on this platform when fishing. In the past a sail of around 30 square metres was used as a means of propulsion. However, these were replaced by 22HP or 39HP inboard diesel engines. The second-generation vessels[4] are built for motorization and were strengthened to withstand engine vibrations. The later engines had around 50-60HP and lately the engine horsepower reaches up to 600 or more. The later generation of fishing vessels which exceed 15.6m in length and beam of 5.0m, can hold minimum of 6MT of fish in ice and travels around 9kn. These vessels are equipped with satellite navigators, hydraulic net haulers and other technological equipment. These vessels have also a special compartment for crew accommodation and are used mainly for long trips. *Mas-dhoani* is used in both the skipjack tuna and yellowfin tuna fishery.

3.6.1.2 Vadhu-dhoani

These are smaller vessels compared to *mas-dhoani* and range around 5-7m in length. These vessels have the same hull structure as the first generation *mas-dhoani*. *Vadhu-dhoani* are used mainly for trolling within the atoll basin and in the reef walls outside the atolls, plus for hand line reef fishing as well as gill netting for sharks.

3.6.1.3 Bokkuraa

These are small row boats about 2.5 m in length and are used as tender boats between the vessel anchorage and the island. They are also widely used for reef fishing near the reef walls located outside the islands using hand lines or net. They are mostly built with coconut timber, but lately there has been a growing trend to use fibre glass instead of wood.

[4] Second generation vessels came in to existence in the mid-1990s and replaced the old fashioned sailing dhoani with a different hull structure.

3.6.2 Fish Catch by different vessels

The mechanisation process which began in the 1970s played a large role in the fishery development of the country. As a result the main portion of the catch from the late 1970 was done through mechanised *mas-dhoani* and as it can be referred in figure 11 there was a significant increase of fish catch for several years. In the year 2007 98% of the total catch was done by mechanised *mas-dhoani* and there was hardly any other type of vessel engaged in fishing-see figure 11.

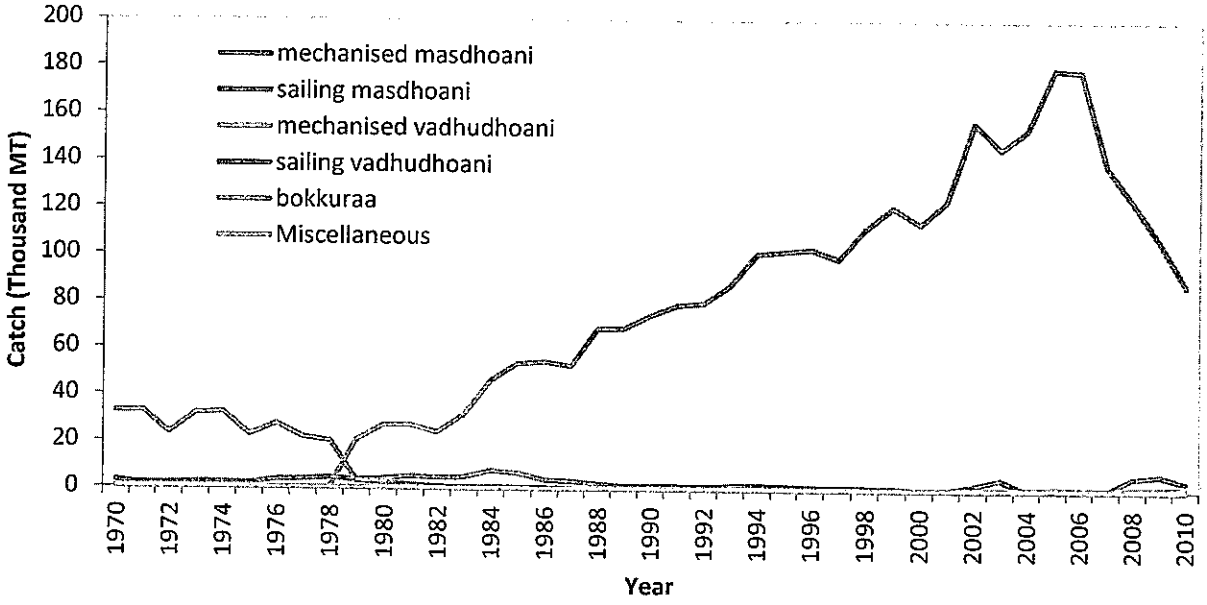

Figure 11: Catch by different vessels from 1970 - 2010

Source: MOFA, Personal Communication, October 01, 2011

The number of vessels engaged in fishing has declined gradually over the years in spite of the considerable increase in catch over the same period-refer to table 4 where the number of vessels decreased from 1376 (in 2000) to 1033(in 2009). There has been a tendency in the past few years for the vessel owners to build larger vessels with higher engine horsepower. Modern vessels (mechanised *Masdhoni*) are equipped with satellite navigation systems, hydraulic line haulers, fish finders, Sonars and other technological equipments. These vessels also have a special compartment for crew accommodation and are used mainly for long trips (2-3 days).

The total fishing fleet in 2009 consisted of 1033 vessels, of which 920 were mechanised pole and line vessels (Masdhoni), 42 mechanised trolling vessels (VadhuDhoni), 18 sailing trolling

vessels and 4 row boats (Bokkura)-see table 4. Mechanised Masdhonis were accountable for largest share (more than 91%) of the annual catch followed by Vadhudhonis (trolling vessels) in recent years (MOFA, 2009).

Table 4: Number of fishing vessels in the Maldives from 2000 - 2009

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mechanised Masdhoni	1137	1128	1102	1104	1092	1002	925	894	867	920
Mechanised Vadhudhoni	58	49	59	46	67	56	44	46	40	42
Sailing Vadhudhoni	72	40	9	4	17	22	18	17	17	18
Sailing Masdhoni	41	66	90	115	8	5	3	10	34	32
Row boats (Bokkura)	19	13	16	18	26	18	14	11	7	4
EEZ	49	20	43	31	36	37	24	25	13	16
Micellaneous						2	1	2	1	1
Total	**1376**	**1316**	**1319**	**1318**	**1246**	**1142**	**1029**	**1005**	**979**	**1033**

4. Data collection

The data collection for the Maldivian fisheries statistics officially began in 1959(Anderson, 1986). Island offices report daily on fish catches to the Ministry of Fisheries and Agriculture (MOFA). Data sheets are also compiled monthly by the island offices and are returned to Male' via the atoll offices. The atoll offices act as a mediator to collect all these monthly reports from the islands to the MOFA. Economic Research and Statistics Services (ERSS) compiles these records and collects catch and effort data directly from the Male' market. ERSS produces annual report of 'Basic Fisheries Statistics' as well as periodic multi-annual summaries. These reports include not only catch and effort statistics, but also export data collected by the Maldives Customs Service. Annual statistics are normally compiled before the middle of the following year, and are reported to interested parties, including the Food and Agricultural Organisation of the United Nations (FAO).

Traditionally the Maldivian fishery was tuna fishery and the fisheries data collection system was primarily developed to record tuna catches(Anderson and Hafiz, 1996). As a result, there are various inconsistencies in the reef fish data collection and researchers have posed questions over the reliability of the reef fish catch statistics.

There are also concerns regarding over and under-reporting of data in the Maldives data collection system. For the period of 1970-1984, Anderson (1986) suggested over and under-reporting may to some extent cancelled out and there is a possibility of ±15% inaccuracy in the

data. In addition, Parry and Rasheed(1995) reviewed the accuracy of 1994 skipjack and yellowfin tuna catches and suggested a 5% under-estimation in skipjack tuna catches and 15% in yellowfin tuna catches.

5. Fisheries Management in The Maldives

Development and management of capture fisheries in the Maldives is governed by the Fisheries Law of the Maldives (Law No. 5/87, August 24, 1987). However, the emphasis of the Law is mainly on protecting the sovereignty of Maldivian waters and also protecting local fishers.

The Environmental Protection and Conservation Act (EPCA) (Law Number 4/93) also contains provisions for the conservation of biological diversity, protected areas and natural reserves. There have been 33 Protected Areas enforced in the Maldives mainly protected for diving purposes. The following activities are prohibited in the protected areas: anchoring (except in an emergency), coral or sand mining, waste disposal, removal of any natural object or living creature, fishing of any kind with the exception of traditional live bait fishing, bird capture and any other activity which may cause damage to the area or its associated marine life (EPA, 2011). In addition, few mangrove habitats are also protected in order to protect birds and swamps which do not affect the fisheries industry directly.

Currently, the fisheries management body in the Maldives – Ministry of Fisheries and Agriculture, does not have any management measures placed in the local harvesting sector. A licensing scheme has been introduced for fishing vessels which intend to sell their catch either to processors which export fish or directly to exporters. The license has to be renewed annually after paying a nominal fee.

Some regulatory measures are also put in place in the skipjack tuna and yellowfin processing sector. The government regulated the skipjack processing sector by limiting the number of post harvesters which might indirectly affect the catch levels until the skipjack processing sector was opened for Small and Medium Scale Enterprises. The yellowfin processors have to pay a royalty charge depending on the weights of the fish which could also indirectly affect the catch limits.

Local fishers suspect that large amount of foreign unlicensed vessels operate in the Maldivian EEZ. There have been several cases of unlicensed vessels being caught by local fishers and the Coast Guard operated by the Maldives National Defence Force (MNDF).

Ministry of Fisheries and Agriculture has banned fishing for dolphins, berried female lobsters and those less than 25cm in total length, whales, giant clams, triton shells, black coral, napoleon wrasse, whale shark and turtles. However, these management regulations and decisions are set ad-hoc and protect the 'fishers from fishing'. Recently, the government has been faced with heavy criticism on enforcement of such regulations and monitoring.

6. Conclusion

The Maldivian fishery is mainly a tuna based fishery. The catch are consumed locally and exported to Asia, Europe, and Africa. Most of the processed tuna are exported in frozen form to Thailand and Iran, in dried form to Sri Lanka and in canned form to Europe.

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بسم الله الرحمن الرحيم

MINISTRY OF FISHERIES, AGRICULTURE AND MARINE RESOURCES

Permission for ····· to culture .....

Temporary Permit No: FA-D4/33/2006/..

1. Permission granted to: ·····

2. Address:

Male',
Republic of Maldives

3. Aquaculture Application Form No.: AQ-P/2006/...

4. Title and permitted duration for completion of works of the aquaculture project:

4.1 Title:

4.2 Permitted duration: 12 months

5. Authorized Activity:

6. Terms and Conditions of Permission:

Date:

Signature:

Name:

Annex A: Guidelines for Proposals for Aquaculture Projects

Applicants for permission for aquaculture activity in the Maldives must submit a detailed project proposal in accordance with the guidelines stated below, providing those details relevant to their proposed project.

PROJECT TITLE:

1. EXECUTIVE SUMMARY

This section should provide a brief outline of each section within the proposal, stating the overall concept of the project.

2. DESCRIPTION OF THE PROJECT

This section should describe the following aspects of the project to provide a detailed understanding of the proposal.

2.1 Nature of the investment

State the nature of proposed investment in concise terms. State the target fishery activity and the product output from the proposed investment. Relate the project to national and fisheries sector development priorities and explain the relevance of the project to Maldives. State project duration and scope of investment.

The summary of investment shall be provided in the format given in Sample Form 1 of this guideline. Documentary evidence of legal entity of project investor shall be provided in the format given in Sample Form 2 of this guideline.

2.2 Project Rationale

State project rationale and justification.

2. 3 Objectives, Outputs, Activities and Verifiable Indicators

State project outputs, activities and verifiable indicators for project outputs.

2.4 Project Site

Provide detail on the project site, including, but not restricted to, the following:

- Land and/or ocean site (include site plan)
- Area of the site (include depth for ocean sites)
- Topography
- Soil type
- Physical and biological characteristics
- Present use of the site
- Present use of the area adjacent to the site
- Proximity to terrestrial and marine protected areas/sites

2.5 Layout of Structures

Provide detail on the layout of the structures, including, but not restricted to, the following:

- Land-based structures: raceways, rearing tanks, water supply tanks, water intake, pumping system, water distribution, waste water outlet, buildings, roads, storm water drainage, sewerage etc. the area of land each will comprise, total land area
- Ocean structures: cages, pens, rafts, areas of ocean each will comprise, total ocean areas

2.6 Design and Engineering Details of Structures

Provide detail on the design and engineering details of proposed structures, including, but not restricted to, the following:

- Land-based structures: raceways, rearing tanks, water supply tanks, water intake, pumping system, water distribution, waste water outlet, buildings, roads, storm water drainage, sewerage etc.
- Ocean structures: cages, pens, rafts, longlines etc.
- Expected life of the structures

2.7 Water Extraction and Discharge

Provide detail on the arrangements for water extraction and discharge, including, but not restricted to, the following:

- Seawater and fresh water input into each facility and total water input into all facilities
- Waste water output from each facility and total water output from all facilities
- Expected quality of input and output water

2.8 Culture Species and their Characteristics

Provide detail on the culture species and their characteristics, including, but not restricted to, the following:

- Scientific and common name(s) of the species
- Species endemic, exotic, rare or abundant
- Biology and ecology of the species

2.9 Culture Techniques and Procedures

Provide detail on the proposed culture techniques and procedures, including, but not restricted to, the following:

- Brood stock source and quantity
- Method of propagation (natural, artificial semi-artificial)
- Seed source and quantity (wild-caught, hatchery produced, imported)
- Mono- or polyculture
- Extensive, intensive or semi-intensive culture
- Containments and devices used for culture – raceways, cage, pen, raft, longline etc.

2.10 Feeds and Feeding

Provide detail on the arrangements for feed procurement and feeding, including, but not restricted to, the following:

- Types of feed used: live feed, trash fish and formulated feed
- Feeding methods

3. AQUATIC ANIMAL HEALTH MANAGEMENT

Provide detail on the arrangements for management of the health of species being cultured and used in the project, including, but not restricted to, the following:

- Quarantine facilities and procedures
- Precautionary measures against disease
- Equipment and expertise for diagnosing disease
- Chemicals used for prophylactic, therapeutic and other purposes

4. WASTE MANAGEMENT SYSTEM

Provide detail on the waste management system, including, but not restricted to, the following:

- Facilities for removing biosolids (faecal material and uneaten feed)
- Waste management (e.g. biosolids) and harvesting plan

5. HRD PLAN AND TECHNOLOGY TRANSFER

Provide a Human Resource Development Plan (HRD Plan) that outlines programs for local human resource development and for technology transfer. Programs outlined in the HRD Plan must be supported in the financial statements. The HRD Plan should clearly identify,

- Programs to develop the skills-base of employees (e.g. employment policy, long term training programs, on the job training programs, staff retention mechanisms).
- Investment to provide staff facilities (e.g. accommodation and lodging, recreational facilities for staff).
- Schemes for staff welfare (e.g. pension, medical care, bonuses, staff support mechanisms).
- Programs for transfer of technology to Maldivians, including transfer of technology to fishers involved in the operation. (e.g. technical training, extension inputs and other support for technological innovation or adoption, education, awareness and capacity building programs).
- Programs to localize the project labor force over the project period.

The Ministry encourages projects that utilize local labor as this has positive multiplier effects on the national economy and on the long-term development of the fisheries industry.

6. INVESTMENT PLAN

6.1 Feasibility Study and the Business Plan

The Business Plan, which constitutes a part of the Feasibility Study, is regarded as a key document and the assumptions and conclusions reached therein will be critical for the evaluation of the Overall Investment Plan. Detailed schedules of sources and applications of funds for various components identified in the body of the proposal must be linked to the financial statements (e.g. HRD Plan, Marketing Plan). Detailed calculations should be based on realistic assumptions and various levels of activities described. The resulting financials should be consistent with each other. These should be consistent with the levels of operations described in the proposal, including the Work Plan.

The Feasibility Study and the Business Plan shall be a comprehensive document that shall, among other aspects, pay special attention to the following:

- Socio-economic data, and relevant projections
- Scope of the investment including capital and human investment
- Proposed investment (in type and magnitude) with special reference to the initial investment
- Financial Plan
- Entry and Exit Costs
- Investment feasibility
- Management team
- Proforma financial statements and analyses linked to other aspects of the proposal, to include:
    - details of capital investments to include civil works, machinery, equipment, furniture and fittings, services, landscaping, transportation;
    - estimates of operating costs, such as wages, food cost, fuel cost, as well as costs related to human resource development;
    - projected financial statements including detailed profit and loss account, balance sheet and cash flow;
    - break-even operation levels in terms of volume of operations and value;
    - list of ratios such as return on investment, and debt to equity ratio, etc.;
    - assumptions used and the basis for making stated assumptions, linked to financial statements.

The pro-forma financial statements and ratios prepared shall comply with internationally accepted accounting practices. All evaluations and computations shall be for at least five (5) years.

6.2 Operational Plan

The project proposal should include an Operational Plan that describes how the project will engage in the proposed project activities (such as purchase, and export of the end product). The Operational Plan should be consistent with other components of the project proposal.

The Operational Plan should state transport and handling arrangements such as operational arrangements for transport of end products to market destinations.

6.3 Financial Plan

The project proposal shall provide a Financial Plan. The Financial Plan is an integral component of the Business Plan. The Financial Plan must be consistent with other components of the proposal and visa versa.

The Financial Plan must include, amongst others, the following,

- Feasibility indicators (based on net present value and internal rate of return).
- Financial ratios (including return on investment, current ratio excluding dividends liability, recovery period).
- Repayment (such as interest, principal repayment and ending balances).
- Payback period.
- Sensitivity analysis to assess impacts on profitability due to possible fluctuations of major variables (such as, world market selling prices) other major cost components.

6.4 Marketing Plan

The Marketing Plan shall clearly demonstrate the market feasibility of proposed product range and output levels. This should include market demand forecasts (describing characteristics of demand, determinants of demand and forecasting) and supply forecasts (describing production levels to meet demand) for proposed products, and price forecasts for proposed products.

The Marketing Plan shall state the Marketing Strategy of the project, including market research for the proposed product range, target markets, market penetration strategies for target markets, and proposed market development activities.

The Marketing Plan should be consistent with, and supported by, the Financial Plan and other components of the proposal.

6.5 Work Plan

The project proposal shall include a Work Plan that consists of a written Work Plan together with a Gantt Chart of project activities. The Work Plan shall be consistent with other components of the proposal.

The Work Plan should identify major milestones of the project and the time periods in which the project proposes to reach these milestones.

The Work Plan should clearly identify

- The distribution of project operations over the proposed project period.
- The initial investment period and activities undertaken within this period.
- The project activities under operational phases subsequent to initial investment.
- The overall implementation (e.g. in case of shore based investments, Work Plan to implement main construction activities).
- The human resource requirement for the proposed investment, and an assessment of availability of local labor to meet these requirements.

The Work Plan should provide a Staffing Plan to meet this human resource requirement (including staff numbers, designations, salaries and remuneration).

The Ministry encourages projects that utilize local labor as this has positive multiplier effects on the national economy and on the long-term development of the fisheries industry.

7. ENVIRONMENTAL IMPACT ASSESSMENT

Applicants for permission for aquaculture activity in the Maldives must submit an Environmental Impact Assessment (EIA) for the proposed project in accordance with the guidelines provided in Annex B overleaf.

The project proposal shall ensure that all actions under the proposal are in conformity with existing rules and regulations relating to environmental conservation and protection applicable at the time of submission of the proposal.

Sample Form 1: Project Proposal

Date: [*Insert date*]
Temporary Permit No: FA-D4/33/2005/..

To: Ministry of Fisheries, Agriculture and Marine Resources of the Government of the Republic of Maldives,

Dear Sir/Madam,

Having examined the Guidelines for Proposals for Aquaculture Projects, we, the undersigned, submit this Aquaculture Project Proposal, and offer to invest a total of *[insert total investment amount in words and figures]* for a period of *[insert investment period]* for the *[insert investment nature and scope]*.

This investment will be undertaken as follows:

I. Initial Investment

[value of initial investment in words and figures] in *[nature of initial investment]* for [*period of initial investment]*

II. Total Investment According to Work Plan

Year 1 - *[value of investment in words and figures]* in *[nature of investment]*
Year 2 - *[value of investment in words and figures]* in *[nature of investment]*

[Extend Year no., value of investment and nature of investment as necessary]

III. Summary of Investment

[Give a brief description of the proposed investment specifying culture species, culture techniques and procedures, and shore based investments, if proposed]

We undertake, if our project proposal is accepted, and the necessary Government clearances obtained, to proceed with the investment in accordance with the terms and conditions of such clearances and permits granted, and in accordance with the proposal submitted.

We further agree to furnish any other requirements the Ministry may require in its evaluation of this proposal. We understand that you are not bound to accept each and every project proposal you may receive.

Dated this _____ day of _____ 2005

_____ _____
[signature] *[in the capacity of]*

Duly authorized to sign application for and on behalf of _____

Sample Form 2: Documentary Evidence of Person or Legal Entity

1. Name of project proponent:
   [Indicate whether an individual, partnership, or company]

2. If the project proponent is an individual, state:

   Present Address:

   Permanent Address:

   [Attach a copy of passport or other such identification]

3. If the project proponent is a partnership, state:

   I. Registered address in full:

   II. Registration number:

   III. Place and date of registration:

   IV. *[Attach copy of partnership agreement that has been duly registered with the concerned authorities.]*

   V. Date of commencement of business:

   VI. Capital outlay:

   VII. Particulars of the partners and the shareholding structure:

Name of partner	Address of partner	% share
i.		
ii.		
iii.		

[Extend as necessary]

4. If the project proponent is a company, state:

   I. Registered address in full:

   II. Registration number:

   III. Place and date of registration:

IV. *[Attach copy of certificate of registration of company, and articles and memorandum of association that have been registered with the Registrar of Companies.]*

V. Nominal share capital of the company:

VI. Issued share capital of the company:

VII. Particulars of shareholders of the company and the shareholding structure:

Name of shareholder	Address of shareholder	No. of shares held
i.		
ii.		
iii.		

[Extend as necessary]

VIII. Particulars of the directors of the company:

Name of director	Address of director	Occupation of Director
i.		
ii.		
iii.		

[Extend as necessary]

[Identify the managing director, etc.]

Annex B: Guidelines for EIA for aquaculture projects

Applicants for permission for aquaculture activity in the Maldives must submit an environmental impact assessment (EIA) for the proposed project in accordance with the guidelines stated below.

PROJECT TITLE:

1. EXECUTIVE SUMMARY

A brief outline of each section within the proposal, giving the overall concept of the project.

2. DESCRIPTION OF THE PROJECT

Brief description of the project components including, need and justification, development objectives, targets and indicators
Brief description of the following components:

A. Facility Design

a. Structure and material of cages, hatchery, nursery, etc
   i. Type, source, material, size and number of cages, hatchery, nursery etc)
   ii. Mooring system for offshore structures
b. Location and placement of the facility
c. Waste minimization, collection and management
d. Related infrastructure and brief description of equipment used including aeration system, filtration system, etc

B. Site Preparation and Construction

a. Description and Schedule of Activities
   i. Time-frame and schedule for site preparation and construction activities
   ii. Methods and materials to be used
   iii. Storage and handling
   iv. Waste management
b. Environmental Impacts during construction
c. Best Management Practices during construction
   i. Conservation of biological diversity
   ii. Maintaining water quality
   iii. Management of materials and wastes

C. Operation and Maintenance

a. Type of species cultured
   i. Local
   ii. Exotic
b. Management of cultured species
c. Feeding
   i Feed types (floating or sinking formulated feed, trash fish)
   ii Feeding techniques and environmental impacts related to feeding
d. Chemical use
   i. Medicines

ii. Feed additives
iii. Pesticides
iv. Disinfectants and other prophylactic substances
v. Environmental Impacts of chemical use

e. Waste Management and Disposal
f. Water Management and Disposal
g. Water quality management
h. Introduction of disease agents associated with introduced and transferred species
i. Ecological and environmental impacts of introduced and transferred species
j. Genetic impacts of introduced and transferred species
k. Effects on non-target species
l. Escape of cultured animals
m. Quarantine arrangements
n. Internal and external transport arrangements
o. Hazard and Risk Management Plan

3. POLICY. LEGAL AND ADMINISTRATIVE FRAMEWORK

a. Identify environmental policies, legislation and environmental administration framework relevant to the project
b. Identify international conventions, treaties and protocol, if required, related to the project and implication for the Maldives

4. STATUS OF THE EXISTING ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

A. Socio Economic Status

a. Past and Ongoing Activities Influencing the Site
    i. Past activities
    ii. Ongoing activities
    iii. Existing infrastructure

B. Status of Physical Environment

a. Weather and Climate
    i. Wind
    ii. Temperature
b. Hydrologic and Oceanographic Features and Shoreline Processes
    i. Shelter conditions
    ii. Bathymetric conditions
    iii. Water depth
    iv. Currents speed and direction
c. Water and Sediment Quality
    i. DO (should be above 5ppm), Seasonal Temperatures, Suspended Solids, Nitrates, Nitrites, Phosphorous, Ammonia, etc…

C. Status of Biological Environment

a. Biological Environment
    i. Terrestrial and coastal flora and fauna

ii. Reef health
iii. Other unique habitats including mangroves, wetlands etc
iv. Test crustaceans from the aquaculture areas for the presence of important shrimp viruses

5. ENVIRONMENTAL IMPACTS

Description and prediction of short-term and long-term environmental impacts

a. Methods, techniques and assumptions made
b. Identify activities and magnitudes of environmental impacts during construction and operation of the projects
c. Socio-economic impacts
d. Cumulative impacts

6. ENVIRONMENTAL MANAGEMENT AND MITIGATION

a. Feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts
b. Estimation of the potential environmental impacts after mitigation
c. Suitability of the proposed methods under local conditions

7. POSSIBLE ALTERNATIVES

a. Comparison of proposed design, site, technology and operational alternatives
b. Potential environmental impacts associated with each alternative

8. ENVIRONMENTAL MONITORING PLAN

a. Development of a monitoring programme to study impacts before and after the initiation of the production phase
b. Who would do it
c. Reporting arrangements